

universe

Jet Propulsion Laboratory

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Goldin rallies JPL troops

By Mark Whalen

NASA Administrator Daniel Goldin addresses JPL staff March 29.

One day after the release of reports reviewing recent Mars mission losses, NASA Administrator Daniel Goldin came to the Lab to encourage staff to continue pushing the engineering and scientific boundaries that have defined JPL for decades.

In addressing the losses of Mars Climate Orbiter and Mars Polar Lander, Goldin acknowledged, "In my effort to empower people, I pushed too hard. And in doing so, stretched the system too thin. It wasn't intentional, it wasn't malicious. We pushed the boundaries more than ever before, and had not yet reached what we thought was the limit. Not until Mars '98.

"I salute the team's conviction and courage, and make no mistake, they need not apologize to anyone. They did not fail alone. As head of NASA, I accept the responsibility."

As part of what he sees as NASA's need to communicate better, Goldin said he came to



Bob Brown/JPL Photo

JPL Wednesday "not to say 'this is what you did wrong,' but rather to say, 'we need you more than ever before.'" He added that he would return to JPL to meet with small groups and with all employees, "not to criticize, but to listen."

"If you have a question that has gone unanswered, or a recommendation or an idea that needs an

outlet, or a comment that needs to be heard, bring it up. At NASA, people will never be punished for telling the truth," he promised.

In pledging his support for the Lab, Goldin cited the litany of JPL spacecraft successes over the last decade. "Let there be no doubt: JPL is and will continue to be the center of excellence for America in deep-space missions."

JPL Mars management office formed

A new office devoted to management of future Mars missions is being formed at JPL, along with another new office that will oversee the implementation of space science flight projects, JPL Director Dr. Edward Stone has announced.

Stone said the changes are being made to provide strengthened institutional support to the implementation of JPL's space science missions, including those to Mars, and to bring added focus to the Laboratory's advanced planning for future missions to Mars. The heads of both new offices will report directly to Stone.

"The new Mars Program Office will be responsible for overseeing the development and implementation of the long-term strategy for the robotic exploration of Mars, for the program architecture, and for the management of related funding," Stone said. "It will be responsible for seeing that top-level program requirements are met." The office will serve as the single point of contact for NASA Headquarters at JPL for all Mars exploration efforts. A new manager is expected to be appointed within a week.

A new JPL Space Science Flight Projects Directorate, to be headed by Tom Gavin, will manage the implementation of space science projects, including those of the Mars Program.

Gavin, currently deputy director of JPL's Space and Earth Sciences Programs Directorate, was previously spacecraft system manager for the Cassini mission. His newly formed directorate will be responsible for all non-Earth-orbiting flight missions. Under JPL's previous management structure, these projects were carried out under SESPD.

Mission operations management for space science missions will be the responsibility of JPL's Telecommunications and Mission Operations Directorate.

Previously, operations for Mars missions and a few others were managed by SESPD. Now, TMOD will be responsible for all deep-space missions in flight.

Mars Program report outlines route to success

An in-depth review of NASA's Mars exploration program, released March 28, found significant flaws in formulation and execution led to the failures of recent missions, and provides recommendations for future exploration of Mars.

The Mars Program Independent Assessment Team, led by seasoned space-industry executive Thomas Young, independently assessed current and future Mars programs and delivered its final report to the agency in mid-March.

"Tom Young and his team have rigorously scrutinized both successful and unsuccessful missions, shining a searchlight into every corner of the incredibly complex endeavor of deep-space exploration," said NASA Administrator Daniel Goldin.

"One of the things we kept in mind during the course of our review is that in the conduct of space missions, you get only one strike, not three," Young said. "Even if thousands of functions are carried out flawlessly, just one mistake can be catastrophic to a mission. Our review confirmed that mistakes can be prevented by applying experienced oversight, sufficient testing, and independent analysis."

The team's charter was to review and analyze successes and failures of recent missions to determine why some succeeded and some failed; examine the relationship between and among NASA Head-

quarters, JPL, Caltech and industry partners; assess the involvement of scientists; identify lessons learned from successes and failures; review the Mars Surveyor Program to assure lessons learned are utilized; oversee Mars Polar Lander and Deep Space 2 failure reviews; and evaluate the risk-management process.

The report concluded the most probable cause of the failure was the generation of spurious signals when the lander legs were deployed during descent. The spurious signals gave a false indication that the spacecraft had landed, resulting in a premature shutdown of the engines and the destruction of the lander when it crashed on Mars.

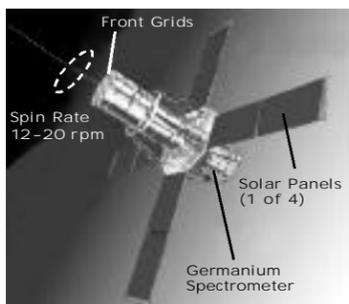
Without any entry, descent and landing telemetry data, there is no way to know whether the lander reached the terminal descent propulsion phase. If it did reach this phase, it is almost certain that premature engine shutdown occurred, the report concluded.

NASA's Office of Space Science will develop an integrated strategic response to the findings and recommendations of the report. NASA Chief Engineer W. Brian Keegan also will coordinate an integrated agency response to the recent reviews of NASA program management practices.

In addition, Dr. Edward Weiler, the associate admin-

Continued on page 2

Spacecraft damaged during tests at JPL



Artist's rendering shows the HESSI spacecraft.

NASA's High Energy Solar Spectroscopic Imager spacecraft (HESSI)—an international mission to explore the basic physics of particle acceleration and energy release in solar flares—has sustained substantial damage during vibration testing at JPL. Repairs to the spacecraft will likely delay its launch to no earlier than January 2001.

The damage was caused March 21 when a test device that simulates vibrations the spacecraft can expect during launch delivered approximately 20Gs, 10 times the appropriate levels for the test. As a result, the spacecraft's structure was damaged and two of the four solar arrays were cracked. The status of the HESSI instrument is not currently known.

Engineers are optimistic that the structure, instrument boxes and detectors were not harmed, but further analysis is required to determine the full extent of the damage. Both damaged solar arrays need to be replaced.

The spacecraft and vibration facility are impounded pending an independent failure review board that will be chaired by NASA's Marshall Space Flight Center, Huntsville, Ala., and supported with experts from Goddard Space Flight Center, Greenbelt, Md., NASA Headquarters and other NASA centers as required. This board will begin investigating this week, and is expected to conclude its efforts in six to eight weeks.

After the spacecraft is released from the vibration facility, the HESSI team will disassemble and re-inspect it, and perform needed repairs. It is expected replacement of the solar arrays will take four to six months.

HESSI was scheduled for launch in July 2000. The cost to repair the satellite has not yet been determined.

HESSI is a Small Explorer mission and is managed by Goddard under the Explorer Program.

News Briefs

'Daughters to Work' April 27

"Free To Be You and Me" is this year's theme for Take Our Daughters to Work Day, which will be held on Thursday, April 27.

JPL retains the name and intent of the national event, but boys are also invited to participate. JPL-specific information, along with sign up information, can be found at the Advisory Council for Women's Web site at <http://eis/acw>.

Children between the ages of 9 and 17 are welcome. The deadline for submitting participation and liability forms is April 10.

More information about the event is available online at <http://www.takeourdaughterstowork.org>.

Galileo receives aerospace award

JPL's Galileo mission has received the prestigious Nelson P. Jackson Aerospace Award for outstanding contributions to planetary exploration.

The award from the National Space Club will be presented at a dinner on March 31 in Washington, D.C. Galileo Project Manager JIM ERICKSON of JPL will be joined by DR. GUENTER RIEGLER, director of the Research Program Management Division at NASA Headquarters.

"I'm really thrilled that the members of the Galileo team are being recognized by their peers," Erickson said.

Recipients of the Jackson Award are selected annually by the National Space Club for their contributions to the astronautics, aircraft and missile industries. The award is a memorial to the late Nelson "Pete" Jackson, one of the founders and past presidents of the organization.

Assistance program now after hours

JPL's Employee Assistance Program now has after-hours service available evenings, weekends and holidays for employees and their families.

The telephone number for the confidential service, which is staffed

by trained mental health professionals, is (888) 438-3115. The after-hours service is being provided to all NASA employee assistance programs by the NASA Occupational Health Program.

The Employee Assistance Program is free for JPL employees and their families, and offers consultation on depression, family problems, stress, substance abuse, financial problems, and other related issues.

For more information, call JPL's Employee Assistance Program at ext. 4-3680.

Architect program deadline coming

Friday, April 14 is the last day to apply for a two-year JPL Architect Development Program internship.

Those interested must submit a current resume and a one- or two-page letter of interest, including why you should be considered for the class of 2002. Concurrence by your division manager is required. Send to MARIA RAYGOZA, HR Staffing, mail stop 1720-C.

For more information or to start the application process, visit the ADP Web site at <http://eis/adp>, or contact BILL CHRISTENSEN at ext. 4-2096.

Summer camp signups underway

Signups are underway for the Child Educational Center's summer camp, "Exploring Our Natural World," to be held June 26 to Aug. 31.

Tailored for children 5 to 12 years of age, the camp will offer open-ended, discovery-oriented opportunities in the form of daily activities, long-term projects, sports, field trips and a unique science component.

The camp will be offered at the CEC main site at 140 Foothill Blvd., adjacent to La Cañada High School; Palmcrest Elementary School in La Cañada; and the CEC site in Pasadena near Caltech.

For more information, call ext. 4-3418.

Special Events Calendar

Ongoing Support Groups

Alcoholics Anonymous—Meeting at 11:30 a.m. Mondays, Tuesdays, Thursdays (women only) and Fridays. Call Occupational Health Services at ext. 4-3319.

Codependents Anonymous—Meeting at noon every Wednesday. Call Occupational Health Services at ext. 4-3319.

Gay, Lesbian and Bisexual Support Group—Meets the first and third Fridays of the month at noon in Building 111-117. Call employee assistance counselor Cynthia Cooper at ext. 4-3680 or Randy Herrera at ext. 3-0664.

Parent Support Group—Meets the third Thursday of the month at noon in Building 167-111. Call Greg Hickey at ext. 4-0776.

Senior Caregivers Support Group—Meets the second and fourth Wednesdays of the month at 6:30 p.m. at the Senior Care Network, 837 S. Fair Oaks Ave., Pasadena, conference room #1. Call (626) 397-3110.

Friday, March 31

American Heritage Week Contest—Entries for the event's theme and logo are due today to Bobby Marin at mail stop 238-528 or via e-mail.

Sat., Apr. 1—Sun., Apr. 2

All-Mozart Concert—The Caltech Chamber Singers and Chamber Music Ensembles will perform a program to be determined, Saturday at 8 p.m., Sunday at 3:30 p.m. in Dabney Lounge. Admission is free. Call (626) 395-4652.

Tuesday, April 4

JPL Gamers Club—Meeting at noon in Building 301-227.

JPL Genealogy Club—Meeting at noon in Building 301-169.

Wednesday, April 5

Associated Retirees of JPL/Caltech Board—Meeting at 10 a.m. at the Caltech Credit Union, 528 Foothill Blvd., La Cañada.

Thursday, April 6

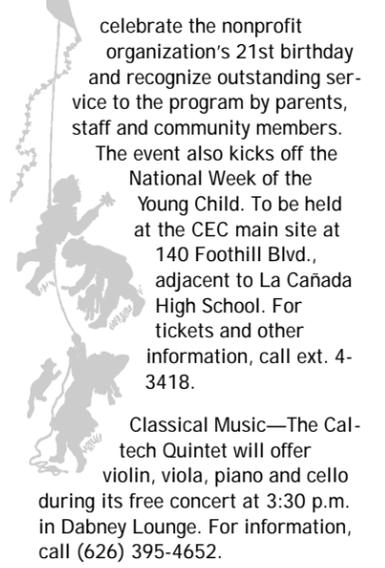
JPL Gun Club—Meeting at noon in Building 183-328.

Friday, April 7

"Second Hand"—Three artists use their bodies and an odd assortment of props in a blend of dance, wit and muscle. Held at 8 p.m. in Caltech's Beckman Auditorium. Tickets are \$22, \$18 and \$14. For information, call (626) 395-4652.

Sunday, April 9

Celebration of Community—The Child Educational Center will hold the annual event from 3 to 6 p.m. to



celebrate the nonprofit organization's 21st birthday and recognize outstanding service to the program by parents, staff and community members.

The event also kicks off the National Week of the Young Child. To be held at the CEC main site at 140 Foothill Blvd., adjacent to La Cañada High School. For tickets and other information, call ext. 4-3418.

Classical Music—The Caltech Quintet will offer violin, viola, piano and cello during its free concert at 3:30 p.m. in Dabney Lounge. For information, call (626) 395-4652.

Tuesday, April 11

JPL Stamp Club—Meeting at noon in Building 183-328.

"Technologies of the Future . . . Today"—Technology and Applications Programs Director Mike Sander will share his expertise and TAP's role in advanced technologies that enable JPL to "do what no one has done before." At 10:30 a.m. in the Building 167 conference room.

Wednesday, April 12

"Acts of God, Acts of Man: How Humans Make Natural Hazards into Disasters"—Caltech geology professor Dr. Kerry Sieh will give this free lecture at 8 p.m. in Caltech's Beckman Auditorium. For information, call (626) 395-4652.

JPL Toastmasters Club—Meeting at 5:30 p.m. in the Building 167 conference room. Guests welcome. Call Mary Sue O'Brien at ext. 4-5090.

Thursday, April 13

Caltech Women's Club—Caltech's female academicians will be saluted during a luncheon and a mini architectural tour of the campus to each of the scientists' labs. To be held at the Athenaeum Hall of Associates. Cost of lunch is \$15 for members, \$17 for non-members and spouses. For more information, call Donna Burdick at (626) 798-0028. Reservations and checks are due April 6 to her at the Caltech Women's Club, 1035 E. Woodbury Rd., Pasadena 91104.

Friday, April 14

Nepal: In the Shadow of Everest—This travel film will be shown at 8 p.m. in Caltech's Beckman Auditorium. Tickets are \$9 and \$7. For information, call (626) 395-4652.

Saturday, April 15

Battlefield Band—The Scottish band will perform Celtic music using a blend of bagpipes, guitar, cittern, synthesizer, fiddle and vocals. Held at 8 p.m. in Caltech's Beckman Auditorium. Tickets are \$25, \$21 and \$17. For information, call (626)

Hubbard as the Mars Program Director at NASA Headquarters. Hubbard is now associate director for astrobiology and space programs at Ames Research Center, Moffett Field, Calif.

[Editor's note: excerpts from JPL Director Dr. Edward Stone's March 28 town hall meeting on page 3 include descriptions of the independent assessment team report findings.]

The Mars reports are available online at <http://www.nasa.gov/newsinfo/marsreports.html>.

Mission gives local kids a 3-D view of their neighborhood

By Susan Mitgang

Lots of ooohs and aaahs were in evidence March 17 for first graders at Andrew Jackson Elementary School in Altadena as the kids put on red and blue anaglyph glasses and saw their neighborhood pop up in three dimensions, thanks to new topographic data from JPL's Shuttle Radar Topography Mission (SRTM), which flew onboard Space Shuttle Endeavour in February.

JPL education outreach coordinator Annie Richardson explained to the children how topographic maps are used to show the height of mountains and other landscape features. She then pointed out local geography on a topographic map that included portions of the San Gabriel Mountains near Pasadena. They looked at the distinctive "V"-shaped intersection of the San Andreas and Garlock faults on a regular map and then compared it to the SRTM image of the same area.

Everyone participated in an activity to show how having two eyes allows people to see in three dimensions. The students were then shown how SRTM's two antennas were also able to "see" in three dimensions. Richardson explained how the new 3-D data would be used to make a

topographic map of most of the world.

Just like the rest of the students, 6-year-old Ashley Ramirez was excited to see the 3-D image of Pasadena. "Ooh, it looks like the mountains are coming right at you," she said.

This was Richardson's second visit to the classroom to talk specifically about SRTM. After this visit, she remarked that she didn't know whether she or the students had enjoyed the visit more. "It was really wonderful reliving the excitement of when I first saw that Pasadena image, this time through the eyes of a child," Richardson said.

JPL staff are available for speaking engagements in classrooms; call Kim Johansen from the JPL Speakers Bureau, ext. 4-9312.



SRTM education outreach coordinator Annie Richardson, standing, looks on as first-graders check out the Pasadena area in 3-D.

Dutch Slagter/JPL Photo

Following the March 28 release of the Mars Program Independent Assessment Team Report (the Young report) and the Report of the Loss of the Mars Polar Lander and Deep Space 2 Missions—JPL Special Review Board (the Casani Report), JPL Director Dr. Edward Stone addressed Laboratory personnel in a town hall meeting. Following are excerpts of his talk.

In addition to the release of the reports today, Headquarters also announced the establishment of a Mars program director, Scott Hubbard. He'll provide the critical focus for NASA Headquarters for the program. The other announcement is that we will proceed toward the launch of the Mars '01 orbiter, but will delay the launch of the '01 lander.

But what I want to focus on this afternoon, in particular, is institutional ownership of mission success. We set out seven or eight years ago on this journey of moving from what I call a second era—the large, comprehensive missions, for which JPL has been justifiably proud and capable of doing—to the new era of doing many small missions. Along that way, we have to make some midcourse corrections.

Why institutional ownership? The Young panel pointed out the nation has a 40-year investment in JPL. That investment is not in some building somewhere, it's in all of you. Our most critical resource is the experience you have captured and continue to capture about the challenges of deep-space exploration.

Clearly, if one of us fails, all of us fail, and that's one thing we've been very aware of over the last six months. We cannot let each other fail. That is our individual responsibility; that's our institutional responsibility.

The Young report concluded that Mars exploration is an important national goal. Another thing they pointed out is that deep-space exploration in particular is especially challenging. Risks will always be there when you're going into deep space, but the risks are manageable. NASA, JPL and industry have the capabilities to implement the program; it's not as though we as a nation are trying to do something that is not possible to do.

The panel concluded that "faster, better, cheaper" can be an effective concept, and one that should continue. In fact, if you want to go often, you don't have any choice but to go faster and at lower cost.

Finally, they found and identified in the report significant flaws in the implementation of Mars '98. The Casani report goes into more technical details of the flaws, but they are all correctable. That's the reason they are confident that we have the capability to explore Mars and deep space in general. That's a very strong endorsement for the program.

The second era of exploration was characterized by Voyager, Galileo and Cassini, where large, comprehensive observatories were sent out to do a global survey of what was out there—setting the stage for the third era. We need to find a way to go much more often, and that in my mind is the motivator for "faster, better, cheaper."

And no matter how carefully we engineer these things, if we're going somewhere we haven't been before, or we're using a technology we haven't have a lot of experience with, there will be risk. So we want to spread the risk among these smaller missions that are going more often.

The key to going more often, of course, is to reduce the cost of mission success.

The Young panel pointed out that we at JPL have already succeeded a number of times with missions of this new character—Pathfinder, Mars Global Surveyor, Deep Space 1, QuikScat, Stardust and the Shuttle Radar Topography Mission—by finding new

ways of doing things at much lower cost, and with success.

So all of you should be proud of the fact that we have been leading the way with a lot of innovative missions that were technically challenging but have been successful. On the other hand, we also have some examples of where we were not successful. We need to learn from those mistakes and make corrections.

With Mars '98, we have found the limits of what can be done, and the Executive Council is committed to making sure we don't go beyond those limits again.

But in the end, the real resource of this place is all of you who have to have the ownership for the success of these missions.

At the Executive Council's retreat last weekend, we organized some of the actions we're going to take under four themes. Let's briefly talk about each of them.

Best Talent and Special Competencies

Clearly, the project manager has the responsibility for end-to-end aspects of the mission. We should have a core project team that is responsible right from the beginning of a project through its implementation and into its operations. And we need to provide the appropriate mentoring, training and support for the many project managers. When we had one or two, or at most, three projects, very experienced teams moved from one project to the next. That has been replaced by 15 smaller projects, and we need to make sure we have in place support systems in training and mentoring, so that the experience those large teams had and carried with them can somehow be provided to the larger range of projects we have.

We have a new allocation from NASA of 5,500 employees that will allow us to have an additional technical workforce.

MIDCOURSE CORRECTION

Downsizing is over. That's an important recognition by NASA that there is a critical contribution the Laboratory needs to make and we need to have a workforce ceiling somewhat higher than we originally targeted.

The other element of core competency is one some of you know about—a study on the possibility of outsourcing our Telecommunications and Mission Operations Directorate to the consolidated space operations contract. NASA has just completed that study, and has reported to Congress that they do not believe that transfer is appropriate or in the best interests of the agency, that in fact JPL should maintain that telecommunications and mission operations activity.

Effective Project/Line Partnership

This assures that the line management has an ownership of the proper execution and the quality of the work that their technical workforce is doing for the project. The deliverables a line organization has with a project will be the subject of a formalized work agreement, so it's very clear we have a plan that makes

sense for both the line organization and the project in terms of mission success.

In addition, as a project continues, there will be top line management involvement as part of this process of ownership of technical activities of our projects. We will allocate additional management resources to ensure that the line managers can be engaged in project activities.

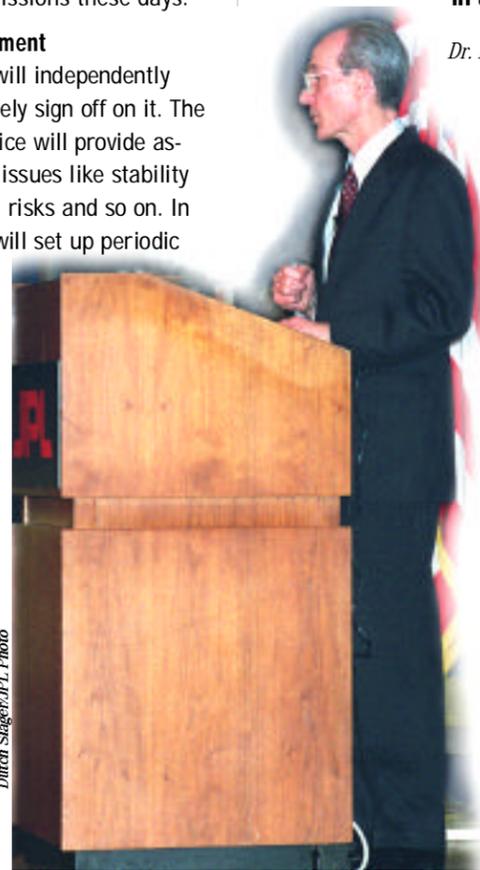
Best Practices

One of the themes in the Young report was that there is a set of sound engineering practices that had to do with mission success—that the risk in missions should be in the new technology, in the new science objectives, with new places, but not in the basic engineering. We have a new set of design principles to use as a basis for this, which will be a gauge for looking at engineering practices, not only on internal projects, but also those to be done by system contractors.

We do not have a set of design principles for software as yet, but clearly we really need one. Software is one of the most critical engineering aspects of missions these days.

Executive Council Commitment

The Executive Council will independently assess a deal and ultimately sign off on it. The Systems Management Office will provide assessment of fundamental issues like stability of requirements, margins, risks and so on. In the Director's Office, we will set up periodic reviews with the management of our major contractors to be sure that issues we are aware of are highlighted, as well as any issues they may be aware of that we should know about in terms of implementation activities at their facility.



Dr. Edward Stone,
JPL director

"The Young panel pointed out the nation has a 40-year investment in JPL. That investment is not in some building somewhere, it's in all of you."

Viewgraphs from Dr. Stone's talk, including the program office reorganization, are available online at <http://ood.jpl.nasa.gov/2000/stone3-28-00.pdf>

In addition to these four themes, there will be some organizational changes here at JPL. [Editor's note: see article on page 1: "JPL Mars management office formed."]

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Notice to Advertisers

No more than two ads of up to 60 words each will be published for each advertiser. Items may be combined within one submission.

Ads must be submitted on ad cards, available at the ERC and the Universe office, Bldg. 186-118, or via e-mail to universe@jpl.nasa.gov.

Ads are due at 2 p.m. on the Monday after publication for the following issue.

All housing and vehicle advertisements require that the qualifying person(s) placing the ad be listed as an owner on the ownership documents.

Passings

BILLIE WORSWICK, 77, a retired secretary in Section 314, died of cancer Feb. 17 at San Diego Hospital. Worswick joined JPL in 1978 and retired in 1990. She is survived by her husband, Donald, daughter Carmen Adams and sons Dwight Worswick and Dan Winston. Services were private.

ALFRED CONSTANTINE, 76, a retired engineer in Section 371, died of cancer Feb. 26 at his home in Arroyo Grande, Calif. Constantine worked at the Lab from 1950-88. He is survived by his wife, Mary Rita, son James, daughter Kathleen and grandson Joshua. Services were private.

Letters

My family and I would like to express our thanks and appreciation to the ERC for the beautiful plant in memory of my father, Al.

Jim Constantine and family

I'd like to thank my section (780) and the ERC on behalf of myself and my family for the beautiful plants and cards sent to me after the sudden death of my father. They will always be a reminder of what a great man he was. Your sympathy is deeply appreciated.

Debbi Deming

To all our friends at JPL . . . we thank you for all your good wishes and all the wonderful times we've had together through the years; we will miss you.

We want to thank you very much for the wonderful and memorable retirement parties you've given us—we truly have wonderful memories to relive, thanks to all of you.

Ted and Betty Sivalon

Retirees

The following JPL employees retired in April: Marilyn Hast, 39 years, Section 310; Harry Strange, 39 years, Section 661; John Ashlock, 36 years, Section 780; Gary Wanczuk, 38 years, Section 314; Carole Hamilton, 32 years, Section 331; James Anderson, 30 years, Section 385; Gerald Crichton, 30 years, Section 366; Stuart Heller, 26 years, Section 311; Michele Fowler, 25 years, Section 387; William Gray, 22 years, Section 311; James Stewart, 22 years, Section 920; Roy Vitti, 22 years, Section 314; Rose Carden, 21 years, Section 395; Leigh Drummy, 16 years, Section 380; Carl Kukkonen, 16 years, Section 820; Richard Ashe, 15 years, Section 185; Hildegard Pitters, 15 years, Section 214.

Classifieds

For Sale

BAR STOOL set, 4 unfinished, hvy. duty, wooden, w/arms & swivel seats, Early American style, \$100/obo; EXERCISER, NordikTrack, unused, \$500/obo, orig. \$900. 957-3022, eves.

BIKE, road, men's 25" Schwinn Le Tour, vg cond., except leather seat is dried out, \$100/obo. 248-9432, Stan.

BIKES, road, specialized, '91 Allez, lg. carbon fiber frame, Sountour, 12-sp. shifters, very light & stiff, choice of triathlon or std. drop bars, Look pedals, \$300 firm. 626/794-0886, Ted.

BOOKSHELVES, floor to ceiling, adj., w/encl. cab., disassembled, no tools req. for assy., about 6'x14"D, \$100. 353-9367.

CABINETS, oak veneer, 78"Hx 24"W, shelves, drawers, \$40/ea. or 3/\$100. 952-1518.

CASSETTE DECK, Teac, dual, W-600R, auto-reverse, \$25. 626/355-6923.

CHIPPER/SHREDDER, Troy-Bilt Jr. Tomahawk, vg cond., 3 hp, chops 2" branches & other yard waste, incl. manual & attach., \$250. 285-9103.

COFFEE TABLE & matching end table, oak: ROCKING CHAIR, bamboo. 626/359-7666. COMPASS/ALTIMETER for car/truck/SUV, Precision Navigation mod. V5000TA, elect. multi-sensor, exc. cond., see at www.precisionnav.com, \$85. 626/564-8405.

COMPUTER, PowerMac clone, Power Computing 150, 160 MHz, 1 GB HD, 32 MB RAM, ext. Zip, 100/CD/33.6K modem, lots of installed software, graphics, keyboard/mouse, \$400/obo. 626/836-1895, Jason.

CRIB/convert toddler bed set, 2 big drawers, chester drawer doubles as changing table, small dresser, white set with pastel trim, \$395/obo. 249-3115.

DAYBED, solid oak, twin, sleigh-style, like new, in hurry to sell, \$115/obo. 626/792-4265.

DESK, computer, Sauder, dark cherry, 35.5 x 19.5 x 29.5"H, keyboard tray, printer shelf, hidden wheels, 1 yr. old, exc. cond., \$120 new at Staples, sell \$80/obo. 805/388-8524, Trish, eves.

DESK, perfect for home office, new, never used, \$175/obo. 626/403-9002.

DESK, office, modern, glass on black metal, like new, 5'x2'x6", purch. for \$120, sell \$75/obo; PHONE SYST., AT&T, 4-line, intercom, speaker, pager, 36 number memory, 2 new in boxes, never used, \$95 ea./\$160 both; FAX, Panasonic KX-F1000, plain paper, hardly used, looks new, 3 yrs. old, \$100/obo. 626/744-9040.

DISKETTES, Zip, 10, \$50. 248-9432, Stan.

DOG HOUSE, lg., for dog up to 70 lbs., \$30/obo. 626/358-0443.

DRYER, Whirlpool, gas, old but works OK, \$50. 957-3675.

LAWN MOWER, Honda, commercial snapper, 5 hp gas eng., rear bag, \$300/obo. 626/584-3204 day, 909/592-0780 eve/weekend.

LUGGAGE, hard-sided, men's Samsonite, drk. brown, 21" & 27"; women's American Tourister, red, 24" & 27"; Bel-aire, lt. brown, 22", \$20. 626/577-8107.

MAPS, topo., on CD ROM, exc. cond., LA/Santa Barbara, San Diego/San Jacinto/Anza-Borrego, \$35. 626/564-8405.

MATTRESS & box-spring set, Beautyrest, queen, clean, \$140; SNAKE, red-tail boa, about 1 yr. old, likes to be held, beautiful coloring, \$90; HAMSTER CAGES, 952-8455.

MISC.: TV, 19", \$90; refrigerator/freezer, \$70; bed, 2 pc., \$50; vacuum cleaner, \$40; table, \$35; telephone, \$10; chairs, 4, \$6 ea; bookcase, \$40; table, TV, \$20; lamp, desk, \$8, all exc. cond. 626/683-3451.

MISC.: tools, gardening equip., sawing mac., furn., antique stove, misc. clothes, black leather suit, coat, skirt, jacket, toys, brick-abrac, etc. 626/794-0455, Oli.

MOVING SALE, everything less than 1 yr. old; desk, 60"x30" w/bkshf., built-in filing cab., pull-out keyboard, \$140; mattress set, full sz., \$45; bookcase, 72"x30"x12", \$35; cartridge, TV w/shelf, \$10; radio, cass./alarm clock, \$10; telephone/answering machine, digital, \$7; telephone, lg. buttons, speaker, \$7; humidifier, \$7. 626/794-7254.

ORGAN, Lowry Genie 88 stereo, w/Genie Chords, band box, 44-note dual keyboards, 13-note pedalboard, asstd. music books/sheet music, perfect for beginner, \$450/obo. 243-4925, after 7 p.m.

PIANO, Roland 6000S elec./digital, full keyboard, handsome dark brown oak finish, like new, purch. new in '88 for \$4,175, make offer. 626/441-2487.

POOL, Doughboy, 16' dia., great cond., ladder, pump, cover, acces., \$1,500/obo. 249-9534.

POOL TABLE, Olhausen Oak Gibraltar 9', oak legs, leather pkts., elec. blue felt, new, hardly used, perfect cond., must see to appreciate, \$2,700/sacrifice \$1,800. page 626/580-9043, Paul.

PRINTER, color, Lexmark 1100, like new, orig. ink cartridge over half full, \$50. 626/254-1550.

PUPPIES, German Shepherd purebred, parents on premises, M/F, \$200/ea. 909/920-0628.

PUPPIES, Jack Russell Terrier, long & short coats, white/black & tri colored, M/F, vaccinations & dewormed, exc. line, received best care, \$500-550. 626/796-7941.

REFRIGERATOR, Kenmore, almond, 20 cf, top freezer, dual humidity ctrls., ice maker, exc. cond., very quiet, must see, \$500. 626/398-6035.

RUGS, Persian kilim, 4 ea., szs. from 78"x48" to 112"x59", a few yrs. old to semi-antique, great quality/looks, pics. avail. on net, \$250-450/offer. 626/744-9040.

SAXOPHONE, Conn alto, complete w/orig. hardshell molded case, swab, plays great, won't last at this price, \$300. 661/297-3933, David, after 4pm, altatension@hotmail.com.

SOFA, 90"x36", dark green plaid, hrwd. trim, 3 cushions, 2 pillows, exc. cond., \$200/obo. 626/358-0443.

SOFA BED, queen & loveseat, tan, wood trim, exc. cond., \$200/both pcs. 626/395-2929 day, 626/791-4493 eve/wknd.

SOFA BED, off-white w/thin pastel stripes, qn. sz. matt., 93"x34", \$150/obo; COFFEE TABLE, plain, walnut, 52"x26", \$30/obo; ENTERTAINMENT CENTER, unit 1: TV, VCR & knick-knack shelves, drawers, 6'x36"x21", unit 2: 6'x30"x16", \$150/obo; TABLE, dining, teak, 48"x34", 2-16" leaf ext., \$100/obo. 626/355-2157, Steve.

STAMP ALBUMS, Scotts specialty series, U.S. Commemoratives, 2 vol., green binder, singles & block of 4; The National 2 vol., green binder; Minuteman U.S. 2vol., binder, '90 standard postage stamp catalogue A-Z, 4 vol. all for \$100. 626/395-8039.

STAR DIAGONAL, for a telescope, Meade, 2.0 inch, exc. cond., \$75. 790-2123.

STEREO, German Grundig, \$250. 562/464-0446.

TABLE, child's, 2 chairs, like new, \$20. 626/795-5235.

TELEPHONE ANSWERING MACHINE, GE, black, single microcass., voice time/day stamp, hardly used, \$20/obo, 626/844-4383.

VACUUM CLEANER, Kenmore, 4.8 amps, w/pwr.

head, exc. cond., \$75/obo. 909/592-0780.

VIDEO GAME, Nintendo 64 syst., complete w/box, 2 ctrls: 1 blk., 1 clr., 2 mem. pks., 1 rumble pk., 5 games, retail \$335, sacrifice, \$175. 661/297-3933 or intogames@hotmail.com.

VIDEO GAME, Nintendo 64 syst., 2 ctrls., almost-new cond., \$85. 909/592-4667.

WISE, wood-working, made in England, high quality, professional, 9" jaw width, opens 13" w/quick release bench dog, well made, brand new, in box, never used, \$150. 626/395-8039.

WASHER & DRYER, Roper, white: washer: top load; dryer: gas, both hvy. duty, \$150/ea., \$250 both/obo. 626/584-3204, day, 909/592-0780, eve/weekend.

Vehicles / Accessories

'95 ACURA Legend LS coupe, 2 dr., black, auto, 104K mi., mint cond., black leather, sunroof, heated seats, alloy wheels, CD changer, remote keyless entry, \$17,000/obo. 626/584-3204 day, 909/592-0780 eve/week-end.

'84 BUICK Century 4-dr. sedan, silver, V6, 3.0, auto, pwr. everything, a/c, stereo/cass., 135K w/47K on rebuilt motor, gd. transportation car, \$1,400/obo. 626/446-3980.

'85 CADILLAC, 2-dr. hrdtop., 90K mi., clean, orig. owner, \$3,500. 909/593-7550 or 909/732-4482.

'91 CHEVROLET Corvette, blk/blk, sharp, glass roof, panel truck, a/c, pwr. steer./win/dr. locks, tilt wheel, cc, am/fm cass., premium sound, ABS, leather, dual pwr. seats, alloy wheels, 122,000 mi., \$10,490. 909/374-2426.

'98 DODGE Durango, loaded, seeing is believing, bids being taken by CEFCU. 800/592-3328, ext. 122 or call your local branch.

'81 FIAT Spider 2000, black w/tan top, good shape, fun to drive w/top down in the spring, \$2,500. 323/225-1732.

'95 FORD Mustang, 3.8L V6, 5 spd. manual, 52K mi., silver, a/c, pwr. everything, cc, stereo, CD/cass., dual airbags, \$8,800/obo. 249-0038.

'93 HONDA Civic coupe EX, white w/neutral int., very nice looking, perfect mech. cond., 5 spd., a/c, cc, alarm/keyless entry, pwr. win./locks, sunroof, great stereo, 74K mi., well maint., complete records, \$8,500. 626/284-9424.

'91 HONDA Accord SE, leather, sun roof, auto, \$5,500. 323/257-8537.

'90 HONDA Accord coupe, 5-spd. manual, a/c, sunroof, alloy wheels, clean, exc. cond., 160K mi., \$4,000/obo. 626/798-4032, John or Sue.

'97 JEEP Wrangler SE, red, 4WD, P/S, P/B, airbags, Kenwood stereo/cass., sound bar, Lo-Jack, ignition cut-off, 31"x10.5" tires, alloy rims, 25K mi., under transf. warr., exc. cond., \$14,900/obo. 248-8103, Mike.

'89 NISSAN 240 SX, 5 spd., a/c, 124K mi., am/fm stereo, exc. cond., \$2,995. 909/599-3230.

'98 PONTIAC convert., white, loaded, 10,200 mi., exc. cond., \$15,000/obo. 790-2123.

'94 & '95 SEADOO GTs, seats 3, almost exc. cond., '94 Ziemann trailer w/box, 3-5 gal. gas cans, extra oil, tow covers, only used in fresh water, always garaged, winterized every yr., all serv. performed by qualified personnel, \$7,000/obo. 626/286-9314, Scott.

'86 TIOGA motor home, 25 ft., fully self-contained, sleeps 6, roof air, awning, TV antenna, 2 eating areas, clean in & out, under 30,000 mi., \$13,500/obo. 353-0267.

'91 TOYOTA Corolla 4 dr. sedan, 5 spd., 125K mi., exc. cond., well maint., all records, a/c, new radiator & tires, \$3,000/obo. 626/794-7254.

'91 TOYOTA 4Runner, 5 spd., white, grey int., sunroof, 4WD, gd. cond. \$8,000/obo. kitamax@aol.com, 909/621-4392 or 909/621-3652, eves.

'91 TOYOTA pickup, xtra cab, deluxe, camper shell, a/c, red, single owner, under 71K mi., exc. cond., \$7,500/obo. 626/449-4326, Gaj.

'90 TOYOTA Corolla, high mileage, otherwise gd. cond., \$2,300. 562/464-0446.

'90 TOYOTA 4Runner, 4 dr. SR5, V6, 4WD, wagon, black w/silver streaks ext., gray int., exc. cond., loaded, grille guards, roof rack, very dependable, hate to give up but growing family needs a minivan, \$8,999 firm. 626/797-8898.

'86 TOYOTA Camry LE, 4-dr. sedan, auto, 86K mi., \$2,000. 626/355-4274.

'76 VOLKSWAGEN bus, bubble top, camper option, exc. cond., new shocks/win. seals. \$3,900. 626/799-2484.

Wanted

METRANOME, mechanical or battery/ electric. 626/441-6848.

ROOMMATE, to share 3+2 house in Acton, view lot, community pool/tennis court, \$400 + 1/2 util. 661/269-8945.

SECURITY GATES, toddler. 626/794-2196.

SNOWBOARD w/bindings for child about 45" tall, boots about sz. 4. 952-8455.

SPACE INFORMATION/memorabilia from U.S. & other countries, past & present. 790-8523, Marc Rayman.

TO RENT apt. or guest house in La Canada/Pas. to 18 y.o. male, up to \$650. 800/733-3380 x114 days. 909/823-4711, eves, Bill Osmond.

TO RENT 2-3 bd., 2 ba. sgl.-fam. home/townhouse close to JPL, professional man & wife moving to JPL from NASA HQ in appx. May. 410/224-2408, bill.huddleston@hq.nasa.gov.

TOYS, Little Tikes, activity type, main interest in climbers & slides, also other types inside/outside toys. 626/303-2633.

VOLLEYBALL PLAYERS, coed, all levels of play, Tues. 8-10 p.m., Eagle Rock High School, \$3/nt. 956-1744, Barbara.

Free

DOG, Lab mix puppy, black, female, 6 mo. old, found abandoned in apt., cat friendly, all shots, house trained, smart, great family pet,

to gd. home. 626/614-1012.

PLANKING, redwood, 8", 2x4 & 2x6, about 8 of ea., some 4x4. 626/794-6860, Eric.

PUPPIES, ready to give away by May, mother is black lab and sweet, father unknown, see pictures at www.invitesite.com/about_dogs. 626/398-4042, Scott & Helen.

For Rent

EAGLE ROCK, rm./bath in lovely home, quiet, use of kitch./washer&dryer/swim pool, 7 mi./JPL, non-smoker, \$400, util. incl. 323/255-0491, Lucia.

ALTADENA, 3 bd., 2 ba., den, f/p, new kit./baths/paint/carpet, master suite w/separate entrance, avail. April 20. 626/794-8517, Art.

EAST PASADENA apt., 2 bd., 1 ba., 1 carport & street pkg., incl. water/trash, 2nd floor, no smoke/pets, carpet, blinds, stove, f/p, a/c, lg. balcony, \$850 + \$850 sec. dep., 1 yr. lease. 949/643-9439.

GLASSELL PARK, 3-bd. duplex, top of hill, 2-car gar., new carpet, cent. a/h, beaut. view, big yard, easy freeway access, 12 mi. to JPL, \$1,500. 323/222-3612.

PASADENA, 1 bd./1 ba. in 2bd./2 ba., lux. apt. complex, secure entry, pool, Jacuzzi, central a/h, part-time, min. 2 nts./wk., \$25/nt. 626/796-5046.

PASADENA, short-term condo lease, 3-12 mos., 1,000 sq. ft., fully furn., 1 bd., gar., patio, laundry, 1 block from Caltech, \$1,095 +\$120 util. 626/285-0730.

SOUTH PASADENA, fully furn. studio apt., nice area at 1718 Huntington Dr., btwn. Marengo & Milan Sts., car space, laundry facilities, no smoke/pets, util. pd., \$565/mo. 626-792-9053, Marilyn.

SYLMAR, brand new home, rent w/option to buy, 20 mi. to JPL, 11 rms., 2,500 sq. ft., f/p, Jacuzzi, bath tub, 2 level view of San Gabriel Mtns., community pool, gated community, \$2,500. 626/584-6526, Fred.

Real Estate

LA CRESCENT, 4 bd., 4 ba., 2,150 sq. ft. house, upstairs master suite, 2-car gar., lemon & plum trees, quiet nbhd., 5 mi./JPL, gd. nearby schools, photos at home.earthlink.net/~lydlar, seek 7/1 closing, \$425K, 957-3022 eves.

PASADENA bungalow home, near JPL/ Caltech, f/p, wood flr., nice kitch., lots of storage, master bd., full ba., laundry rm., huge gar. w/working shop area, huge backyard w/fruit trees/flowers, must see to appreciate, as is, \$185,000. 626/794-0455, Ollie or Bill.

Vacation Rentals

BIG BEAR CITY, 4 miles from ski slopes, 2-bd., 1-ba. cabin, nicely furnished, sleeps 8, fireplace, TV, full kitchen, microwave, \$100 refundable cleaning deposit; \$75/nite weekdays, \$250/weekend (2 nites). 909/982-2986.

BIG BEAR LAKE cabin, nr. ski area, lake, shops, village, forest, 2 bd., sleeps up to 6, f/p, TV, VCR, phone, microw., BBQ & more, JPL disc. from \$65/nt. 909/210-9182.

BIG BEAR LAKEFRONT, lux. townhome, 2 decks, tennis, pool/spa, near skiing, beaut. master bd. suite, sleeps 6. 949/786-6548.

CAMBRIA ocean front house, sleeps up to 4, exc. view. 248-8853.

HAWAII, Kona, on 166 ft. of ocean front on Keauhou Bay, priv. house & guest house, comfortably sleep 6, 3 bd., 2 ba., rustic, relaxing & beaut., swim, snorkel, fish, spectac. views, near restaur., golf courses, other attractions. 626/584-9632.

HAWAII, Maui condo, NW coast, on beach w/ocean vw., 25 ft. fr. surf, 1 bd. w/loft, com- pl. furn., phone, color TV, VCR, microw., d/w, pool, priv. lanai, slps. 4, 4/15-12/14 rate \$100/nite/2, 12/15-4/14 rate \$115/nite/2, \$10/nite add'l. person. 949/348-8047.

LAKE TAHOE, north shore, avail. after 6/1, 2 bd., 2-1/2 ba., sleeps 6-7, private sandy beach, pool, great loc., all amenities, hike/golf/fish, 2 mi. to casinos, weekly rates, JPL disc. 626/355-3886, Rosemary or Ed.

LAKE TAHOE, west shore @ Homewood in Chamberlands, close to northern ski areas: Squaw, Alpine Meadows, etc., assn. pool/tennis, private beach, 3 bd. + loft, 2 ba., slps. 8, linens provided, full kitch. & laundry, TV/VCR, wood stove, wood provided, 2 day min., JPL disc., \$75 cleaning fee. 626/585-0321, Bob or Nicole.

LAS VEGAS, 1 block from Strip, close to Flamingo Hilton, 2 bd., 2 ba., timeshr. condo, fully equipped kitch., TVs, VCR, laundry rm., pool, Jul-Sep & Nov-Dec rate \$125/nt., all other \$110/nt., rent or sell. 909/592-4667.

MAMMOTH, Snowcreek, 2 bd., 2 ba., + loft, sleeps 6-8, fully equip. kitch. incl. mcrrvw., d/w, cable TV, VCR, phone, balcony w/view to mtns., Jacuzzi, sauna, streams, fishponds, close to Mammoth Creek, JPL disc. 626/798-922